

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A vertical-cavity device comprising:

(a) a chip comprising an active semiconductor layer configured to provide optical gain;

(b) a first mirror arranged on a first side of the active layer;

(c) a second mirror arranged on a second side of the active layer, opposite to the first mirror, and forming with at least the first mirror an optically resonant cavity that passes through the active layer in a direction out of the plane of the active layer; and

(d) a heatspreader for removing heat from the active layer, the heatspreader being arranged inside the cavity and having a first surface adjacent to the chip and a second surface opposite to the first surface, the heatspreader being transparent to light of wavelengths in an operating bandwidth of the device, and ~~having at least one further selected property that has a further selected~~ wherein the second surface of the heatspreader is curved or includes a curved structure or is at a non-parallel angle to the first surface, so that the heatspreader in addition to removing heat from the active layer is of a shape that provides a selected optical effect function on light output

~~from the device, in addition to the effect of removing heat from the active layer.~~

2. (Cancelled)

3. (Cancelled)

4. (Cancelled)

5. (Cancelled)

6. (Cancelled)

7. (Cancelled)

8. (Currently amended) A device as claimed in claim 1, in which the second surface of the heatspreader is curved or includes a curved surface and the heatspreader focuses or defocuses the output light.

9. (Currently amended) A device as claimed in claim 1, in which the second surface of the heatspreader is curved or includes a curved surface and the heatspreader focuses pump light into the active layer.

10. (Currently amended) A device as claimed in claim 1, in which the selected optical effect function is on light generated in the active semiconductor layer at a fundamental frequency of the device.

11. (Cancelled)

12. (Currently amended) A device as claimed in claim 1, in which the heatspreader has a refractive index that has been selected to provide substantially no refractive index step at the first surface.

13. (Original) A device as claimed in claim 12, in which reflectance at the first surface of the heatspreader is less than 5%.

14. (Original) A device as claimed in claim 10, in which the heatspreader has a refractive index that has been selected to provide a refractive index step at the first surface.

15. (Cancelled)

16. (Original) A device as claimed in claim 1, in which the heatspreader has a shape selected to provide control of a spatial mode of the output light.

17. (Currently amended) A device as claimed in claim 16, in which the second surface of the heatspreader is curved or includes a curved surface and the heatspreader focuses or defocuses intracavity light.

18. (Original) A device as claimed in claim 17, in which the second mirror is flat.

19. (Original) A device as claimed in claim 18 in which the second mirror is a MEMS mirror.

20. (Original) A device as claimed in claim 1, in which the second surface of the heatspreader has a dielectric coating.

21. (Original) A device as claimed in claim 20, in which the dielectric coating is an anti-reflection coating.

22. (Original) A device as claimed in claim 20, in which the dielectric coating is a mirror coating and forms the second mirror.

23. (Original) A device as claimed in claim 1, in which the heatspreader has a thickness of less than 1.5 mm.

24. (Original) A device as claimed in claim 1, in which the heatspreader is a loss modulator.

25. (Currently amended) A method of manufacturing a vertical-cavity device, comprising:

(a) fabricating a chip comprising an active semiconductor layer for providing optical gain;

(b) providing a first mirror on a first side of the active layer;

(c) providing a second mirror on a second side of the active layer, opposite to the first mirror, which forms with at least the first mirror an optically resonant cavity that passes through the active layer in a direction out of the plane of the active layer;

(d) providing in the cavity a heatspreader for removing heat from the active layer, the heatspreader having a first surface adjacent to the chip and a second surface opposite to the first surface, the heatspreader being transparent to light of wavelengths in the operating bandwidth of the device; and (e) ~~selecting at least one property of the heatspreader to have,~~ wherein the second surface of the heatspreader is curved or includes a curved structure, so that the heatspreader is of a shape that provides a selected optical effect function on the output light, in addition to the effect of removing heat from the active layer.

26. (Original) A method as claimed in claim 25, including the step of forming the second surface of the heatspreader to be curved or to include a curved structure.

27. (Original) A method as claimed in claim 26, in which the curved surface is formed by polishing.

28. (Original) A method as claimed in claim 26, in which the curved surface or the curved structure is formed by etching.

29. (Original) A device manufactured by a method according to claim 25.

30. (Original) An amplifier or laser including a source of pump light comprising a device according to claim 1.

31. (Original) An amplifier or laser as claimed in claim 30 that is a Raman amplifier.

32. (Currently amended) A vertical cavity device comprising:

(a) a chip comprising an active semiconductor layer for providing optical gain;

(b) a first mirror arranged on a first side of the active layer suitable for forming with at least a second mirror arranged on a second side of the active layer, opposite to the first mirror, an optically resonant cavity that passes through the active layer in a direction out of the plane of the active layer; and

(c) a heatspreader for removing heat from the active layer, having a first surface adjacent to the active layer and a second surface opposite to the first surface, the heatspreader being transparent to light of wavelengths in an operating bandwidth of the device and wherein the second surface of the heatspreader is curved or includes a curved structure, or is at a non-parallel angle to the first surface, so that the heatspreader in addition to removing heat from the active layer, at least one further selected

~~property that has a~~ is of a shape that provides a selected optical effect function on light output from the device.

33. (New) A device as claimed in claim 1 in which the second surface of the heatspreader includes a convex curved surface.

34. (New) A device as claimed in claim 25 in which the second surface of the heatspreader includes a convex curved surface.

35. (New) A device as claimed in claim 32 in which the second surface of the heatspreader includes a convex curved surface.

36. (New) A device as claimed in claim 1 in which the heatspreader has a truncated wedge-shape.

37. (New) A device as claimed in claim 32 in which the heatspreader has a truncated wedge-shape.